BRITISH COLUMBIA

2004/05 Sea Lice Monitoring and Auditing Program

1.0 Rationale

Sea lice are a common parasitic copepod that can affect the health of farmed and wild fish. Sea lice monitoring conducted on salmon farms provides information for effective management and treatment decisions at the farm level. The intent of this program is to gather information from the monitoring of lice on all farms within specific fish health zones/areas looking at trends in lice levels, the management of sea lice on farmed salmon and integration with data on wild stock migration, when possible.

A working group of fish health experts and veterinarians responsible for management of the aquaculture stocks will assist with integration of the information collected and evaluation of the effectiveness of the program.

The program has been divided by salmon species due to differences in susceptibility to lice between farmed fish species.

Definitions:

***Lepeophtheirus salmonis*:**

Adult female – includes adult female lice with egg strings (i.e. gravid) or without egg strings.

Mobile/Motile Lice – includes all motile stages: adult females (as above) plus adult male and pre-adult male and female lice.

Caligus – total numbers of motile *Caligus sp.* lice.

Chalimus - attached immature stages. *Caligus* and *Lepeophtheirus* species combined as identification at very early stages is not practically possible.

Year class – age of fish in saltwater. Year-class "one" is defined as the date of saltwater entry for the first fish on site plus 12 months. Year-class two is defined as the remaining time in saltwater. Broodstock would be included in the year two group, up to March 1st of the year in which eggs are to be taken. See Broodstock section for more detail.

2.0 Sampling Protocols

2.1 Atlantic Salmon Farms

Sampling will be conducted once a month on every site within each Ministry of Agriculture, Food and Fisheries (MAFF) zone/sub zone (unless an acceptable reason for not sampling is provided [1]).

Monthly sampling intensity will be increased to twice monthly when the action level of 3 motile lice per fish is reached anytime throughout the year. During juvenile wild salmon out migration times (March to July), action (treatment or harvest) should be taken to reduce lice levels if the farm reaches the level of 3 motile lice per fish. As part of the control strategy, information from all other farms within an area will be reviewed and an area management strategy developed between operators for control of lice levels. It is expected that companies will share information and data on sea lice levels in developing strategies for control of sea lice.

Some risk factors that need to be considered in development of an area management strategy include farm location, lice levels, timing for juvenile wild salmon migration, location of farms relative to each other and to migration corridors, and environmental data (water temperature/salinity/oceanographic conditions).

2.2 Sampling Regime

Monthly sampling at each site will be conducted in three pens; a total of 20 fish per pen (site total = 60 fish). Pens chosen for sampling should include one "standard or index pen" (i.e. first pen entered in the system and/or the pen with the highest probability of having lice based on site historical information) and two randomly selected pens per sample period.

Fish should be captured using a seine or other method that ensures a representative sampling of the population. Fish should be placed in anesthetic bath or humanely euthanised before examination. Handling should be minimized to avoid loss of lice. Method of handling should be recorded. All fish selected should be examined for the presence of lice regardless of fish health status. Fish

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[1] Reasons for not reporting include:

1 Site is harvesting and < 3 pens left on site

2 Smolt entry and < 3 pens on site, or <1 month since third smolt pen entered

3 Fish being treated for sea lice

4 Fish being treated/ managed for other fish health problem

5 Fish could not be handled due to environmental problem, e.g. low DO

may be culled or otherwise removed from the population, if appropriate, once lice counts have been recorded.

All fish should be examined for the presence of lice and numbers of lice recorded. Lice counts should be recorded in the following categories:

Lepeophtheirus species

- Adult females (with & without egg strings)
- Mobile lice (adult female/male and preadult male and female)
- Chalimus (total) and
- Caligus (total)

When sampling is completed, water in the anesthetic tote should be examined for detached sea lice. These must be categorized, counted and recorded as the "tote count". These counts must be included when calculating the total pen lice number/average.

All lice counts should be reported to the BCSFA database. Data must be entered on or before the 10th of the month following the month in which the sampling was done. Monthly summary reports of the aggregate data per sub-zone will be provided to MAFF on the 20th of the month following the sampling (example: January reports February 20th).

Environmental information including monthly average dissolved oxygen, temperature and salinity at the surface (0-1 meters), 5, and 10 meters should be recorded and reported to the BCSFA database.

2.3 Sea Lice Sampling Protocols for Broodstock

Definition: Broodstock - fish that are designated as Broodstock and are not part of production populations.

Rearing practices: Broodstock may initially be entered into saltwater directly into a Broodstock site or entered into a production site and then later designated as Broodstock while still at the production site. After they are designated as Broodstock, these fish may stay at the production site, or be moved to another site including a designated Broodstock site.

Rationale: The BC salmon farming industry depends almost entirely for its egg source on Broodstock reared in BC water. Previous data has shown that older year classes of fish may carry higher lice counts than younger year classes of fish[i]. During the period of out-migrating wild stocks, Broodstock, due to the duration of their time in seawater, will require sea lice sampling. The correlation between stressful events like fish handling, exposure to anesthetics and crowding has been extensively studied and clearly shows a link between broodstock survival, timing of ovulation, egg size, egg quality and survival and larval quality and survival.

Therefore sea lice counts on broodstock need to be done in such a way as to give representational numbers, but to keep broodstock handling to a minimum.[ii]

1. Fish designated as Broodstock should be sampled in the same manner as production fish until their second winter at sea, i.e., the Broodstock pens might be selected in the normal course of selecting three pens on the site during the month for sampling. If a Broodstock pen is selected, 20 fish will be sampled.
2. Prior to the period of the out-migrating wild populations, all Broodstock populations on Broodstock sites and all Broodstock populations at production sites that are a different year class than the production fish on site will be sampled in January/February of their second winter at sea. 20 fish/pen will be sampled.
3. To reduce handling related injuries and stress on Broodstock, after January/February of the year in which those fish will/would have spawned as 2 sea-winter Brood, all sea lice monitoring will occur opportunistically (or via convenience sampling). In-other-words, all sea lice monitoring will be done in conjunction with other routine Broodstock handling procedures such as sorting or immunization.
4. Broodstock will, however, still be subject to a visual inspection twice per month for the presence of sea lice and any associated grazing.
5. For Broodstock held over for spawning as 3 or 4 sea-winter fish, sampling will be conducted in January/February of each year to ensure levels are low in March. 20 fish per pen will be sampled. Due to the risks associated with handling, all other sampling throughout the year will be (1) opportunistic (or via convenience sampling) when other Broodstock handling takes place, for example, sorting or immunizing, or (2) if recognized problems with sea lice occur. These fish will be subject to a visual inspection twice per month for the presence of sea lice and any associated grazing.

2.4 Pacific Salmon Sites

Results from sampling Pacific salmon over the last year have confirmed scientific information from previous studies that farmed Pacific salmon are not as susceptible to increased lice levels as Atlantic salmon. As a result, MAFF will not be requesting routine lice reporting from this sector. **However, it is expected that Pacific salmon producers will sample their stocks for sea lice at times when lice are observed (for example during regular daily or weekly visual observations) and at times when lice have historically been documented (example harvest fish or yearclass two fish in the Fall of the year).** This information must be available for audit review to MAFF fish health staff upon request.

3.0 Audit of Farm Sites by BCMAFF

MAFF will continue to monitor 25% of active Atlantic salmon sites per quarter for Quarters 1, 3, and 4 of each year. During monitoring and surveillance activities at the selected sites, 10 fish will be selected from the 20-fish sample from each of the three sample pens for evaluation by BCMAFF staff. The fish will be systematically examined by the BCMAFF Fish Health Technician and lice numbers enumerated and classified as outlined above. BCMAFF staff may also collect lice samples from anaesthetized or euthanised fish for periodic evaluation and confirmation of lice species and life-stage. Environmental data (water temperature, salinity at 0-1, 5 and 10m) for the day of the audit will be recorded.

During Quarter 2 (April to June inclusive) MAFF audit and surveillance activities will increase to 50% of all Atlantic salmon sites for farms with fish that have been in saltwater for greater than 120 days (based on the date of first pen entered on a site). **For sites that are selected for audit during this quarter, the audit sample will be conducted as a second monthly sample and not as the industry required monthly sample.** Sampling will be conducted as described above.

This new protocol will allow for increased monitoring and auditing during wild smolt migration periods in addition to normal farm monitoring activities without compromising the health of newly entered smolt that are less likely to have lice (based on data from 2003/04). Our efforts are thus focused on the populations more likely to have lice.

4.0 Reporting to the BCSFA Database

All Atlantic salmon farms will record the sea lice data as outlined above. This information will be required to be reported monthly to the industry Fish Health Database as a requirement of Fish Health Management Plans.

The BCSFA Database will continue to report monthly aggregate findings by subzone and should include the average number of female lice, motile lice and Caligus species per year class.

Environmental data should be included for each year class in each sub zone reported by industry to the industry Database. Environmental data will be evaluated by the industry Fish Health Technical Committee for trends and variation in lice levels.

The Technical Committee will also review the number of treatments per sub-zone or other actions taken to control sea lice by species in each sub-zone and for each year class. This information will be available quarterly through the fish health events report posted on BC MAFF's website.

5.0 Public Reporting

Reports on lice levels will be made public by BCMAFF through their website. Reports will include average sea lice numbers by species in each sub zone for each year class of fish.

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[i] http://www.agf.gov.bc.ca/fisheries/health/Sealice_monitoring_results.htm

[ii] Bromage, N., Jones, J., Randall, C., Thrush, M., Davies, B., Spingate, J., Duston, J. and Barker, G. (1992). Broodstock management, fecundity, egg quality and timing of egg production in the rainbow trout (Oncorhynchus mykiss). Aquaculture, 100; 141-166.

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